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Differentiating, we must have for a maximum or minimum, $C'\sec^2\varphi d\varphi = C\sec^2\varphi' d\varphi'$. $d\varphi = d\varphi'$.

Eliminating the differentials, $C'\sec^2\varphi = C\sec^2\varphi'$.

Solving this and the given relation for φ, we find

$$\tan^2\varphi = \frac{C^2 - CC'}{C'^2 - CC'} = -\frac{C}{C'}.$$

But $\dfrac{-C}{C'} = -\dfrac{\tan\varphi}{\tan\varphi'}$. Hence $\tan\varphi\tan\varphi' = -1$.

This shows that $\varphi - \varphi' = 90°$.

Also solved by *H. C. WHITAKER*, and *G. B. M. ZERR*.

PROBLEMS FOR SOLUTION.

ALGEBRA.

145. Proposed by JOHN M. COLAW, A. M., Monterey, Va.

Solve the equations:

$$\begin{aligned} &x + y + z + u + w = 1,\\ &ax + by + cz + du + ew = h,\\ &a^2x + b^2y + c^2z + d^2u + e^2w = h^2,\\ &a^3x + b^3y + c^3z + d^3u + e^3w = h^3,\\ &a^4x + b^4y + c^4z + d^4u + e^4w = h^4. \end{aligned}$$

146. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Solve by a short original method, if possible:

$$\begin{aligned} &x/a + y/b + c/z = P \ldots.(1),\\ &x/a + b/y + z/c = Q \ldots.(2),\\ &a/x + y/b + z/c = R \ldots.(3). \end{aligned}$$

GEOMETRY.

180. Proposed by R. TUCKER, M. A.

ABC is a triangle; *A'*, *B'*, *C'* are the images of *A*, *B*, *C* with respect to *BC*, *CA*, *AB*. The circum-circle *ABC* cuts *A'BC* (say) in *K* (on *A'B*), *M* (on *A'C*), and *AK*, *AM*, *AA'* cut *BC* in *P*, *R*, *Q*, respectively. Prove that (1) the orthocenters of the associated triangles lie on circle *ABC*; (2) triangle *AKM* has its sides parallel to and equal twice the sides of the pedal triangle of *ABC*. and is also equal triangle formed by the above-named orthocenters; (3) $CP.a = b^2$,